Serial No. 09/542222   - 3 -   Art Unit: 2128

In the claims:

1. (original) A channel shortening method comprising:

determining a first shortened channel impulse response for a communication channel using a first channel modeling scheme;

forming a time-mirrored image of the first shortened channel impulse response;

determining a second shortened channel impulse response for the time-mirrored image of the first shortened channel impulse response using a second channel modeling scheme; and

combining the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response.

2. (original) The channel shortening method of claim 1, wherein determining a first shortened channel impulse response for a communication channel using a first channel modeling scheme comprises applying an auto-regressive moving average model using p_1 poles and q_1 zeros to form the first shortened channel impulse response having a first approximation $H_1(z) = B_1(z)/1+A_1(z)$, wherein q_1 is greater than a predetermined cyclic prefix length.

3. (original) The channel shortening method of claim 1, wherein determining a second shortened channel impulse response for me time-mirrored image of the first shortened channel impulse response using a second channel modeling scheme comprises applying an auto-regressive moving average model using p_2 poles and q_2 zeros to form the second shortened channel impulse response having a second approximation $H_1(z) = B_1(z)/1+A_1(z)$, wherein q_1 is less than or equal to a predetermined cyclic prefix length.

4. (original) The channel shortening method of claim 1, wherein the first shortened channel impulse response has a first approximation $H_1(z) = B_1(z)/1+A_1(z)$ and the second shortened channel impulse response has a second approximation $H_2(z) = B_2(z)/1+A_2(z)$, and wherein combining the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response comprises combining $A_1(z)$ and $A_2(1/z)$ with appropriate delay.

5. (original) The channel shortening method of claim 1, wherein the first channel modeling scheme is based upon a pole-zero model having p_1 poles and the second channel modeling scheme is based upon a pole-zero model having p_2 poles and wherein the number of taps in a channel shortening filter equals ($p_1 + p_2 + 1$).

6.(original) The method of claim 1, wherein the communication channel is an Asymmetric Digital Subscriber Line (ADSL) upstream channel.

7. (original) An apparatus comprising a time-domain equalizer for equalizing a communication channel and training logic for training the time-domain equalizer based upon a training signal received over the communication channel, wherein the training logic is operably coupled to determine a set of coefficients for the time-domain equalizer using a two-pass auto-regressive moving average model.

8. (original) The apparatus of claim 7, wherein the training logic comprises:

first channel modeling logic operably coupled to determine a first shortened channel impulse response for the communication channel;

inversion logic operably coupled to form a time-mirrored image of the first shortened channel impulse response;

second channel modeling logic operably coupled to determine a second shortened channel impulse response for the time-mirrored image of the first shortened channel impulse response; and

coefficient determination logic operably coupled to combine the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response.

9.(original) The apparatus of claim 8, wherein the first channel modeling logic is operably coupled to apply an auto-regressive moving average model using p_1 poles and q_1 zeros to form the first shortened channel impulse response having a first approximation $H_1(z) = B_1(z)/1 + A_1(z)$, wherein q_1 is greater than a predetermined cyclic prefix length.

10. (original) The apparatus of claim 8, wherein the second channel modeling logic is operably coupled to apply an auto-regressive moving average model using p_2 poles and q_2 zeros to form the second shortened channel impulse response having a second approximation $H_2(z) = B_2(z)/1+A_2(z)$, wherein q_2 is less than or equal to a predetermined cyclic prefix length.

11. (original) The apparatus of claim 8, wherein the first shortened channel impulse response has a first approximation $H_1(z) = B_1(z)/1+A_1(z)$ and the second shortened channel impulse response has a second approximation $H_2(z) = B_2(z)/1+A_2(z)$, and wherein the coefficient determination logic is operably coupled to combine $A_1(z)$ and $A_2(1/z))$ with appropriate delay in order to obtain the third shortened channel impulse response.

12. (original) The apparatus of claim 8, wherein the first channel modeling logic is based upon a pole-zero model having p_1 poles and the second channel modeling logic is based upon a pole-zero model having p_1 poles, and wherein the number of taps the time-domain equalizer equals ($p_1 + p_2 + 1$).

13. (original) The apparatus of claim 7, wherein the communication channel is an Asymmetric Digital Subscriber Line (ADSL) upstream channel, and wherein the apparatus is a central ADSL terminal unit.

14. (original) A program product for training a time-domain equalizer based upon a training . signal received over a communication channel, the program product comprising:

first channel modeling logic programmed to determine a first shortened channel impulse response for the communication channel;

inversion logic programmed to form a time-mirrored image of the first shortened channel impulse response;

second channel modeling logic programmed to determine a second shortened channel impulse response for the time-mirrored image of the first shortened channel impulse response; and

coefficient determination logic programmed to combine the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response.

15. (original) The program product of claim 15, wherein the first channel modeling logic is programmed to apply an auto-regressive moving average model using p_1 poles and q_1 zeros to form the first shortened channel impulse response having a first approximation $H_1(z) = B_1(z)/1+A_1(z)$, wherein q_1 is greater than a predetermined cyclic prefix length.

16. (original) The program product of claim 14, wherein the second channel modeling logic is programmed to apply an auto-regressive moving average model using p_2 poles and q_2 zeros to form the second shortened channel impulse response having a second approximation $H_2(z) = B_2(z)/1+A_2(z)$, wherein q_2 is less than or equal to a predetermined cyclic prefix length.

17.(original) The program product of claim 14, wherein the first shortened channel impulse response has a first approximation $H_1(z) = B_1(z)/1+A_1(z)$ and the second shortened channel impulse response has a second approximation $H_2(z) = B_2(z)/1+A_2(z)$, and wherein the coefficient determination logic is programmed to combine $A_1(z)$ and $A_2(1/z)$ with appropriate delay in order to obtain the third shortened channel impulse response.

18. (original) The program product of claim 14, wherein the first channel modeling logic is based upon a pole-zero model having p_1 poles and the second channel modeling logic is based upon a pole-zero model having p_1 poles, and wherein the number of taps the time-domain equalizer equals $(p_1 + p_2 + 1)$.

19. (original) The program product of claim 14, wherein the communication channel is an Asymmetric Digital Subscriber Line (ADSL) upstream channel.

20. (original) A communication system comprising a first communication device in communication with a second communication device over a communication channel, wherein the

first communication device is operably coupled to transmit a training signal to the second communication device over the communication channel, and wherein the second communication device is operably coupled to determine a set of coefficients for a time-domain equalizer from a received training signal using a two-pass auto-regressive moving average model.